Bio 264 Homework #2

Nicholas J. Gotelli

Due: 4 February 2016

Create a new markdown file called `<Your last name>_HW#2_04Feb2016`. Cut and paste the problems below into Markdown, then add chunks of R code to provide your answers. You will turn in just the `.Rmd` file for this homework assignment.

Some of these problems are adapted from:

> Jones, O., R. Maillardet, and A. Robinson. 2009. Scientific Programming and Simulation Using R. CRC Press, Boca Raton.

1. Suppose $x = 1.1$, $a = 2.2$, and $b = 3.3$. First, reproduce each of the following equations in markdown (by setting them within the `$$` boundaries). Next, assign each expression to the value of the variable $z$and print the value stored in z.

   a) x^{a^b}
   b) $(x^a)^b$
   c) $3x^3 + 2x^2 + 1$
   d) The digit in the second place of z (hint: use `floor()` and/or `&&`)

2. Using the `rep` and `seq` functions, create the following vectors:

   a) $(1, 2, 3, 4, 5, 6, 7, 8, 7, 6, 5, 4, 3, 2, 1)$
   b) $(1, 2, 2, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 5, 5)$
   c) $(5, 4, 4, 3, 3, 3, 2, 2, 2, 2, 1, 1, 1, 1, 1)$

3. Create a vector of two random uniform numbers. In a spatial map, these can be interpreted as x and y coordinates that give the location of an individual (such as a marked forest tree in a plot that has been mapped). Using one of R's inverse trigonometry functions (`asin()`, `acos()`, or `atan()`), convert these numbers into polar coordinates (If you don't know what polar coordinates are, read about them on the web or in your calculus textbook).

4. Suppose that `queue <- c("sheep", "fox", "owl", "ant")` and that `queue` represents the animals that are lined up to enter Noah's Ark, with the sheep at the front of the line. Using R expressions, update the queue successively as

   a) the serpent arrives;
   b) the sheep enters the ark;
   c) the donkey arrives and talks his way to the front of the line;
   d) the serpent gets impatient and leaves;
   e) the owl gets bored and leaves;
   f) the aphid arrives and the ant invites him to cut in line.
   g) Finally, determine the position of the aphid in the line.

5. Use R to create a vector of all of the integers from 1 to 100 that are not divisible by 2, 3, or 7.

6. Create a vector `z` of 1000 random uniform numbers.

   a) create a vector that contains 3 numbers: the proportion of the numbers in z that are less than 0.10, greater than 0.90, and between 0.45 and 0.55.

b) Making successive copies of z, transform your vector of uniform numbers in the following ways:
   - *log (base 10)* of z
   - z^2
   - e^z
   - *square root of z*

c) for each case calculate your vector of 3 numbers to get the new proportions.

d) typeset the formulas from (b) in markdown (with the `$$` brackets).